

CLAIMS

1. Mode rotation piezoelectric motor (1) comprising a stator (10) fixed to a frame (3) of the motor and designed to bend perpendicular to a principal direction (D), said stator comprising electroactive components (12, 13) stacked in said principal direction, surrounded by two counter-weights (11, 14), characterised in that said stator (10) has geometric dissymmetry (52) in order to create resonance dissymmetry.

2. Motor according to claim 1, characterised in that the electroactive components are piezoelectric ceramics.

3. Motor according to claim 1 or 2, characterised in that the geometric dissymmetry is obtained by means of a dissymmetrical method of fixing the stator to the frame.

4. Motor according to any one of claims 1 to 3, characterised in that the geometric dissymmetry is obtained by means of the use of anisotropic materials for the stator.

5. Motor according to any one of claims 1 to 4, characterised in that the geometric dissymmetry is obtained by means of a dissymmetrical shape (52) of the stator, and particularly a dissymmetrical shape of the counter-weights.

6. Motor according to claim 5, characterised in that the stator comprises piezoelectric ceramics in the form of wafers, the wafers and counter-weights being approximately cylindrical in shape and coaxial to a shaft (2) connecting the stator to the frame (3),

said counter-weights comprising recesses on either side of the shaft (52).

7. Motor according to claim 5 or 6, characterised in that the stator comprises counter-weights that are approximately identical in shape to each other, so that for two respective axial planes (P1, P2) defined so that a first axial plane P1 for a first counter-weight (11) represents on the second counterweight (12) a plane orthogonal to the second axial plane P2 for said second counter-weight (12), the two axial planes (P1, P2) form a non-zero angle to each other on the stator.

8. Motor according to any one of claims 5 to 7, characterised in that each wafer (12, 13) comprises around an axis of rotation of the rotor 20, sectors of piezoelectric material (123, 124, 133, 134) with alternate axial polarity (P+, P-), arranged so that each of the sectors on a first wafer is at least partly opposite a sector with the opposite polarity on another wafer.

9. Motor according to claim 7 or 8, characterised in that the two axial planes (P1, P2) form an angle approximately equal to 90°.

10. Motor according to claim 9, characterised in that the stator comprises wafers that are approximately identical in shape to each other, so that for two respective median planes (PM1, PM2) defined identically for each of the wafers independently, the two median planes form a 90° angle to each other, and a first (P1) of the axial planes (P1, P2) of the counter-weights is co-planar with a first (PM1) of the median planes, and respectively, a second (P2) of the axial planes is co-planar with a second (PM2) of the median planes.

11. Motor according to claim 9, characterised in that the stator comprises wafers that are approximately identical in shape to each other, so that for two respective median planes (PM1, PM2) defined identically for each of the wafers independently, the two planes form a 180° angle to each other and the axial  
5 planes (P1, P2) form a 45° angle to the median planes.

12. Motor according to any one of claims 6 to 11, characterised in that it comprises a single-phase power supply (40) that comprises an earth (42) and a phase (41), so that the phase is connected to an interface (1213) between two  
10 wafers and the earth is connected to surfaces (112, 141) of said wafers respectively opposite the said interface (1213), or so that the earth is connected to an interface (1213) between two wafers and the phase is connected to surfaces (121, 132) of said wafers respectively opposite said interface (1213).

13. Motor according to claim 10, characterised in that it comprises a single-phase power supply (40) that comprises an earth (42) connected to an interface (1213) between two wafers (12, 13) and a phase (41) powering a primary of a transformer, said transformer comprising two identical secondaries (S1, S2), a first (S1) of which is connected between the earth and a surface (121)  
15 of one of the wafers (12), opposite the interface (1213), to supply to it a first phase 411, and the other secondary (S2) is connected by means of an inverter (K) between the earth and a surface (132) of the other of the wafers (13), opposite the interface (1213) to supply it with a second phase (412) equal or  
20 opposite to the first phase (411) depending on the position of the inverter.

14. Method of powering a mode rotation piezoelectric motor (1) comprising a stator (10) fixed to a frame (3) of the motor and designed to bend perpendicular to a principal direction (D), said stator comprising piezoelectric ceramics (12, 13) stacked in said principal direction, surrounded by two counter-weights (11, 14),  
5 said stator (10) having geometric dissymmetry (52) in order to create resonance dissymmetry, characterised in that a single-phase power supply (40) is used.

15. Method according to claim 14, characterised in that an intermediate usage frequency ( $F_u$ ) with two respective resonance frequencies ( $F_1$ ,  $F_2$ ) of two  
10 bending modes (M1, M2) characteristic of the resonance dissymmetry is used for the power supply (40).

16. Method according to claim 15, characterised in that a power supply frequency is used that is more particularly selected so that the phase difference  
15 between the two bending modes is  $90^\circ$ .